(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 3 144 453 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
22.03.2017 Bulletin 2017/12

(51) Int Cl.:
E05B 19/00 *(2006.01)* ***E05B 27/00*** *(2006.01)*
E05B 15/06 *(2006.01)*

(21) Application number: **15186135.8**

(22) Date of filing: **21.09.2015**

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME
Designated Validation States:
MA

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(54) **KEY AND KEY CYLINDER**

(57) The invention regards a key cylinder (10) comprising a cylinder core (7) with a key way (13) for inserting a corresponding key (1), a cylinder cam (8) for operating a locking bolt, and a blocking washer (9), wherein the blocking washer (9) is inserted between the cylinder core (7) and the cylinder cam (8) or in a slot of the cylinder core (7) such that the cylinder cam (8) is located on a first side and any core pin (11) is located on a second side of the blocking washer (9), and wherein the blocking washer includes at least one cutout (12) or at least one protrusion (6) extending in a direction in which a key (1) has to be inserted into the key cylinder (10).

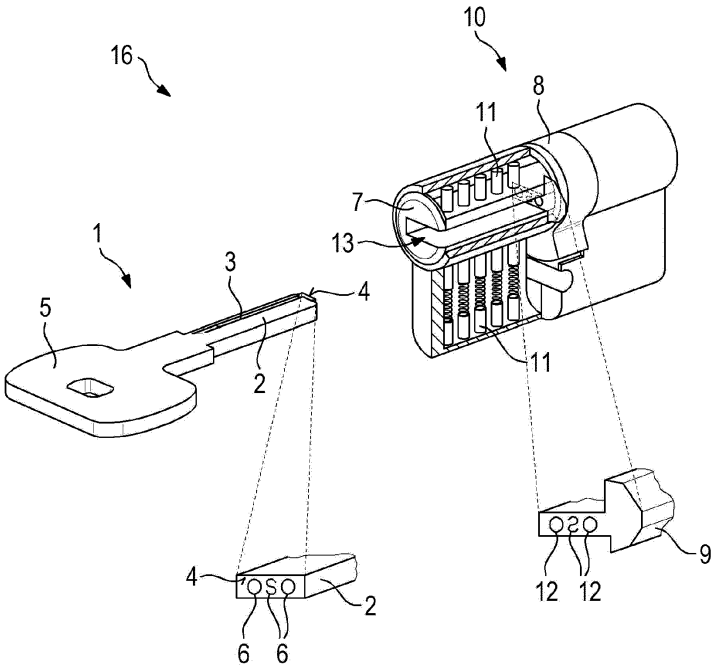

Fig. 1

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Description

[0001] The present invention relates to a key cylinder. Further, the invention relates to a key. Finally, the invention relates to a system comprising a key cylinder and a key.

[0002] From the prior art, there are known several key systems, in particular master key systems. Such systems allow to provide different keys which allow different access within a building equipped with such a master key system. However, one of the biggest problem for an owner of such master key systems is the increased possibility and increased presence of manufacturing of unauthorized keys. Such a situation can limit any security investment into a building or can destroy such an investment in a very short period of time.

[0003] It is therefore an object underlying the present invention to provide a key cylinder as well as a key that are easy to manufacture and provide increased security without creating high costs.

[0004] A solution of this object is achieved by the feature of the independent claims. The dependent claim contain advantages and embodiments of the present invention.

[0005] The solution is achieved by a key cylinder comprising a cylinder core, a cylinder cam and a washer. The cylinder core is provided with a key way for inserting a corresponding key. In particular, the key way comprises several core pins, which prevent the cylinder core from rotating in case no or a none-fitting key is inserted into the key way. The cylinder cam is provided for operating a locking bolt. In particular, the cylinder core and the cylinder cam are coupled, such that a rotation of the cylinder core leads to a rotation of the cylinder cam. Due to the rotation of the cylinder cam, the locking bolt can be operated in order to lock or unlock a door.

[0006] The blocking washer is inserted between the cylinder core and the cylinder cam or is inserted in a slot of the cylinder core. Therefore, the cylinder cam is located on a first side and any core pin of the cylinder core is located on a second site of the blocking washer. The blocking washer includes at least one cut-out or at least one protrusion. The cut-out or the protrusion extends in a direction in which a key has to be inserted into the key cylinder. Therefore, the blocking washer provides a further security feature, which has to be fulfilled by a key. In case a key does not comprise a protrusion or a cut-out corresponding to the cut-out or the protrusion of the blocking washer, the key will not match the key cylinder. Therefore, operating the key cylinder is not possible.

[0007] The blocking washer preferably prevents the key from getting fully inserted into the cylinder core in case the protrusion or the cut-out of the blocking washer does not match the cut-out or the protrusion of the key. Therefore, the key is prevented from moving at least one core pin into an unlocked position such that the key is not able to unlock the cylinder core, such that the cylinder core cannot be rotated. Hence, operating the key cylinder with a key not having a matching protrusion or cut out is prevented.

[0008] The invention further comprises a key. The key comprises a blade, a key tip, and a key bow. The blade includes a key bit. Further, the blade extends between the key tip and the key bow. The key tip has at least one protrusion or cut-out extending in a direction in which the key has to be inserted into a key cylinder. Hence, the protrusion or cut-out is preferably provided on the blade opposite to the key bow. Preferably, that key is provided whit the above mentioned key cylinder. Therefore only a key comprising a protrusion or cut-out matching the protrusion or cut-out of the blocking washer of the key cylinder can be inserted into the key cylinder. The protrusion or cut-out therefore provides a further security feature which helps to identify a key authorized to operate the key cylinder.

[0009] In a preferred embodiment, the protrusion and the blade of the key or the blocking washer of the key cylinder are formed integrally. Therefore, the blade or the blocking washer are easy to manufacture and are very stable in operating the cylinder cam.

[0010] The protrusion preferably extends over at least 70 %, preferably at least 80 %, in particular at least 90 % of a thickness of the blade or the key way. Therefore, the protrusion or cut-out has large dimensions, which increases a contact area in case the protrusion or cut-out of a key fits into the corresponding cut-out or protrusion of the key cylinder. Therefore, the protrusion or cut-out allows an additional transmittal of forces between the key and the key cylinder or the blocking washer.

[0011] In a preferred embodiment, the protrusion and / or the cut-out comprise a code pattern. Therefore, the protrusion and / or cut-out allow to further distinguishing between different keys such that the number of possible different keys is increased.

[0012] The code pattern covers a maximum of 80 %, preferably 70 %, in particular 60 % of the area of the key tip or the key way. The area of the key way is preferably the cross section of the key way, which is left empty in order to allow introducing a blade. Due to said dimensions, the code pattern covers a large area such that the code pattern is clearly distinguishable from other code patterns. Thus, the code pattern provides an increased security. Further, the code pattern can comprise several distinguishable features, such that the code pattern itself allows providing different keys.

[0013] The protrusion and / or the cut-out have a dimension in an inserting direction of the key of at least 1.0 mm. Preferably, the dimension is at least 1.5 mm. Therefore, the protrusion and / or the cut-out of the key are clearly recognizable. Further, the blocking washer prevents the key from being fully inserted by the above mentioned distances. Preventing the key from being fully inserted by at least 1.0 mm, preferably 1.5 mm, ensures that at least one core pin of the key cylinder cannot be operated by the key bit. Thus, the key cannot unlock the cylinder core of the key cylinder such that the cylinder

core cannot be rotated. In this way, the cylinder cannot be operated to unlock any lock driven by the key cylinder, when using an incorrect key. An incorrect key is present in case the protrusion and cut-out of key and key cylinder do not match.

[0014] The protrusion and the cut-out are preferably point symmetric to a central point of the protrusion and / or the cut-out. This allows providing a symmetric key, which can be inserted in different orientations into the key cylinder. Therefore, the handling of the key and the key cylinder is simplified.

[0015] The invention finally regards a system comprising a key as described above as well as a key cylinder as described above. Such a system allows for increased security, since there is an additional feature provided which has to be fulfilled by both, the key and the key cylinder, in order to allow the key operating the key cylinder. Said additional feature comprises the combination of protrusion and cut-out. Only in case the cut-out matches the protrusion, the key can be fully inserted into the key cam. Only a fully inserted key displaces all core pins of the key cylinder into an unlocked position such that the cylinder core of the key cylinder can be rotated by the key.

[0016] In the following, detailed embodiments of the invention are described with respect to the attached drawings. In the drawings;

Fig 1 is an overview of a system comprising a key cylinder and a key according to a preferred embodiment of the present invention,

Fig. 2 is a first schematic view of the key tip of the key according to the preferred embodiment of the invention, and

Fig 3 is a second schematic view of the key tip of the key according to the preferred embodiment of the invention.

[0017] Figure 1 shows a system 16 comprising a key cylinder 10 and a key 1, each according to a preferred embodiment of the present invention. The key 1 comprises a key bow 5 and a key tip 4, therein a blade 2 extends between the key bow 5 and the key tip 4. The blade 2 further includes a key bit 3, which allows operating core pins of the key cylinder 10.

[0018] The key 1 further comprises three protrusions 6 which are provided on the key tip 4. On said key tip 4, the protrusions 6 extend in a direction in which the key 1 has to be inserted into the key cylinder 10.

[0019] The key cylinder 10 comprises a key core 7. Further the key cylinder 10 comprises several core pins 11, which block any rotation of the cylinder core 7 unless a fitting key 1 is inserted. In order to insert the key 1, the cylinder core 7 provides a key way 13, in which the blade 2 of the key 1 can be inserted. The key cylinder 10 further comprises a cylinder cam 8 and a blocking washer 9. The cylinder cam 8 is provided for operating a locking bolt. Therefore the cylinder cam 8 has to be operated in order to allow locking or unlocking of a door equipped with the key cylinder 10 according to the preferred embodiment of the invention. In order to operate, i. e. rotate, the cylinder cam 8, the cylinder core 7 has to be rotated. However the cylinder core 7 can only be rotated in case all core pins 11 are guided into an unlocked position, which unlocks the cylinder core 7. In order to reach such an unlocked position, a correct key 1 has to be inserted into the key way 13.

[0020] The blocking washer 9 includes a further security feature. The blocking washer 9 comprises three cut-outs 12, which correspond to the protrusions 6 of the key tip 4. The blocking washer 9 is provided in a slot of the cylinder core such that the cylinder cam 8 is located on a first side and any core pin 11 is located on a second side of the blocking washer 9.

[0021] As soon as the key 1 is inserted into the key cylinder 10, there will be a situation in which the protrusions 6 of the key tip 4 abut the blocking washer 9. Only in case the protrusions 6 match the cut-outs 12, the key 1 can be further inserted into the key cylinder 10, which leads to the protrusions 6 being inserted into the cut-outs 12. Only in this situation, i. e. in case the protrusions 6 are inserted into the cut-outs 12, the key bit 3 of the blade 2 of the key 1 will be in a position in which all core pins 11 are operated into said unlocked position. Therefore, only in the fully inserted position oft the key 1, the cylinder core 7 and the cylinder cam 8 can be rotated.

[0022] In a case the protrusions 6 do not match the cut-outs 12, the protrusion 6 will put the blocking washer 9 such that the key 1 cannot be further inserted. However, in any position other than the fully inserted position, the key bit 3 of the blade 2 of the key 1 cannot operate all core pins 11 into the unlocked position. Therefore, the cylinder core 7 is prevented from being rotated by the key 1, such that the cylinder cam 8 cannot be operated.

[0023] The protrusions 6 and cut-outs 12 preferably comprise a code pattern. In particular, the protrusions 6 on the key tip 4 comprise a code pattern which is set up by the three letters O S O. The code pattern of the protrusions 6 is recognizable for any user of the key 1, such that the code pattern can help to identify which key cylinders 10 can be operated with the key 1.

[0024] As can be seen from figure 2, the protrusions 6 extend over at least 70 %, preferably at least 80 %, in particular at least 90 % of a thickness 15 of the blade 2. Therefore, the code pattern set up by the protrusions 6 is clearly recognizable. Further, a contact surface between the protrusions 6 and the cut-outs 12 of the blocking washer 9 is increased.

[0025] As can be seen from figure 3, the protrusions 6 protrude into a direction, in which the key 1 has to be inserted into the key cylinder 10. A length 14 of the protrusions 6 is at least 1.00 mm, preferably 1.5 mm. Therefore, it is ensured that the key bit 3 is prevented from operating the core pins 11 into the unlocked position in

case the protrusions 6 do not match the cut-outs 12. In this case, the key 1 can only be pushed into a position which is 1.0 mm, preferably 1.5 mm, away from a position in which the key 1 is fully inserted into the key cylinder 10.

[0026] The protrusions 6 and cut-outs 12 therefore provide an additional security feature. The additional security feature does not limit the number of different key profiles, which is only dependent from the number of core pins 11. Therefore, complex mechanical master key systems can be extended in a low-cost way. Since the blocking washer 9 is a part separate from the cylinder core 7, the blocking washer 9 can be exchanged without changing the key cylinder 10 or key core 7. In particular, the key way 13 will remain equal even in case the blocking washer 9 is exchanged.

[0027] In order to enhance security, the blocking washer 9 is coupled to the cylinder cam 8. Only in case the blocking washer 9 is rotated by the key 1, the cylinder cam 8 will be rotated, too. Therefore, the cylinder cam 8 can only be rotated in case the key 1 comprises protrusions 6 which fit into the cut-outs 12 of the blocking washer 9.

List of reference numerals

[0028]

1	key
2	blade
3	key bit
4	key tip
5	key bow
6	protrusion
7	cylinder core
8	cylinder cam
9	blocking washer
10	key cylinder
11	core pin
12	cutout
13	key way
14	length
15	thickness
16	system

Claims

1. Key cylinder (10) comprising

- a cylinder core (7) with a key way (13) for inserting a corresponding key (1),
- a cylinder cam (8) for operating a locking bolt, and
- a blocking washer (9),
- wherein the blocking washer (9) is inserted between the cylinder core (7) and the cylinder cam (8) or in a slot of the cylinder core (7) such that the cylinder cam (8) is located on a first side and any core pin (11) is located on a second side of the blocking washer (9), and
- wherein the blocking washer includes at least one cutout (12) or at least one protrusion (6) extending in a direction in which a key (1) has to be inserted into the key cylinder (10).

2. Key cylinder (10) according to claim 1, **characterized in that** the blocking washer (9) prevents the key (1) from getting fully inserted into the cylinder core (7) in case the protrusion (6) does not match the cutout (12) such that the key (1) is prevented from moving at least one core pin (11) into an unlocked position.

3. Key (1) comprising

- a blade (2) including a key bit (3),
- a key tip (4), and
- a key bow (5),
- wherein the blade (2) extents between the key tip (4) and the key bow (5), and
- wherein the key tip (4) has at least one protrusion (6) or cutout (12) extending in a direction in which the key has to be inserted into a key cylinder (10).

4. Key (1) according to claim 3 or key cylinder (10) according to claim 1 or 2, **characterized in that** the protrusion (6) and the blade (2) or the blocking washer (9) are formed integrally.

5. Key (1) according to claim 3 or 4 or key cylinder (10) according to any of claims 1, 2 or 4, **characterized in that** the protrusion (6) or cutout (12) extents over at least 70%, preferably at least 80%, in particular at least 90% of a thickness of the blade (2) or the key way (13).

6. Key (1) according to any of claims 3 to 5 or key cylinder (10) according to any of claims 1, 2, 4 or 5, **characterized in that** the protrusion (6) and/or the cutout (12) comprise a code pattern.

7. Key (1) or key cylinder (10) according to claim 6, **characterized in that** the code pattern covers a maximum of 80%, preferably 70%, in particular 60%, of the area of the key tip (4) or the key way (13).

8. Key (1) according to any of claims 3 to 7 or key cylinder (10) according to any of claims 1 or 2 or 4 to 7, **characterized in that** the protrusion (6) and/or the cutout (12) have a length (14) in an inserting direction of the key (1) of at least 1.0 millimeters, preferably 1.5 millimeters.

9. Key (1) according to any of claims 3 to 8 or key cylinder (10) according to any of claims 1 or 2 or 4 to

8, **characterized in that** the protrusion (6) and/or the cutout (12) are point symmetric to a central point of the protrusion (6) and/or cutout (12).

10. System (16) comprising a key (1) according to any of claims 3 to 9 or key cylinder (10) according to any of claims 1 or 2 or 4 to 9.

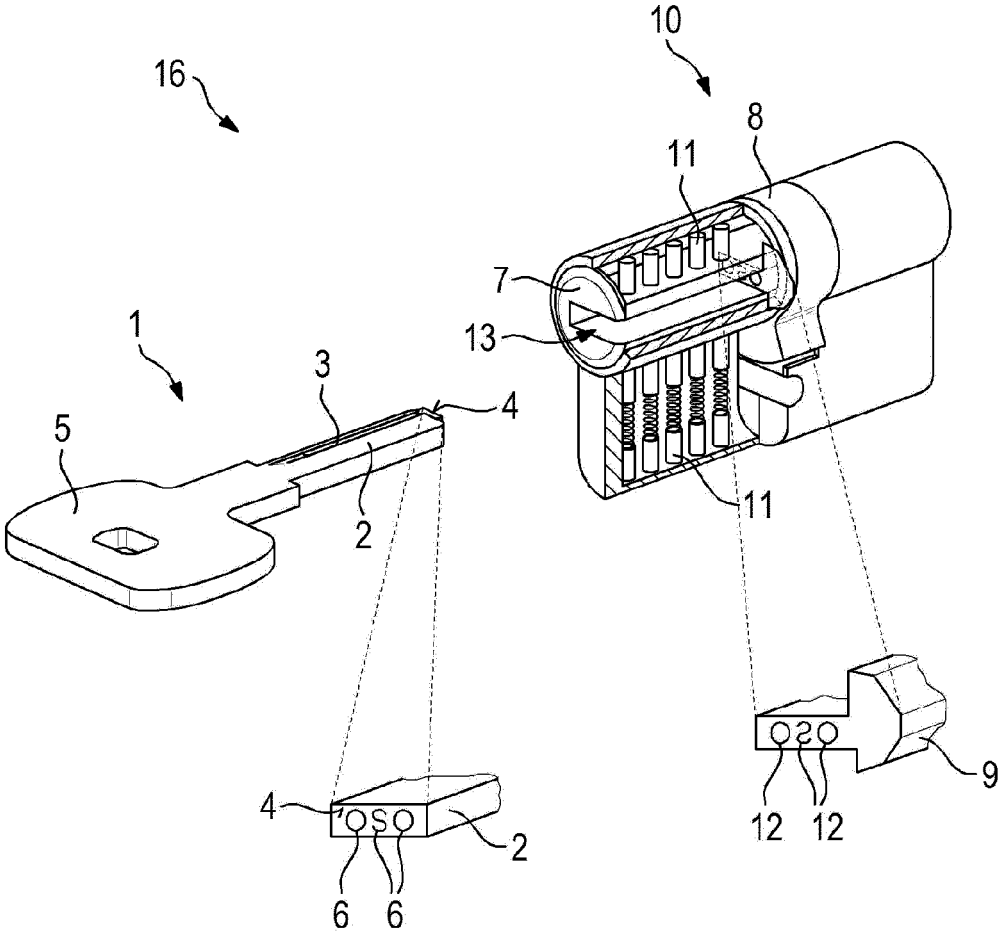

Fig. 1

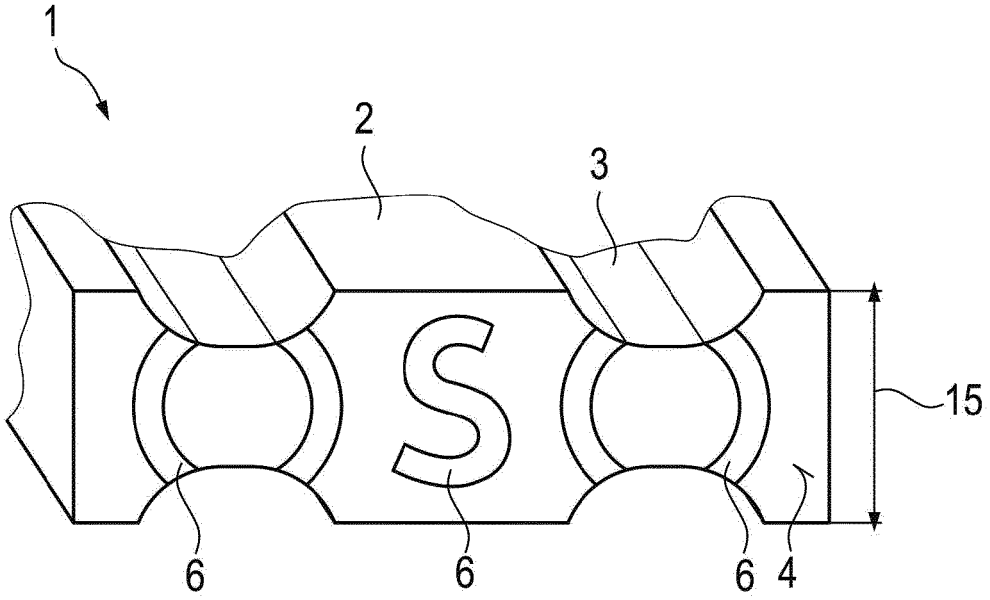

Fig. 2

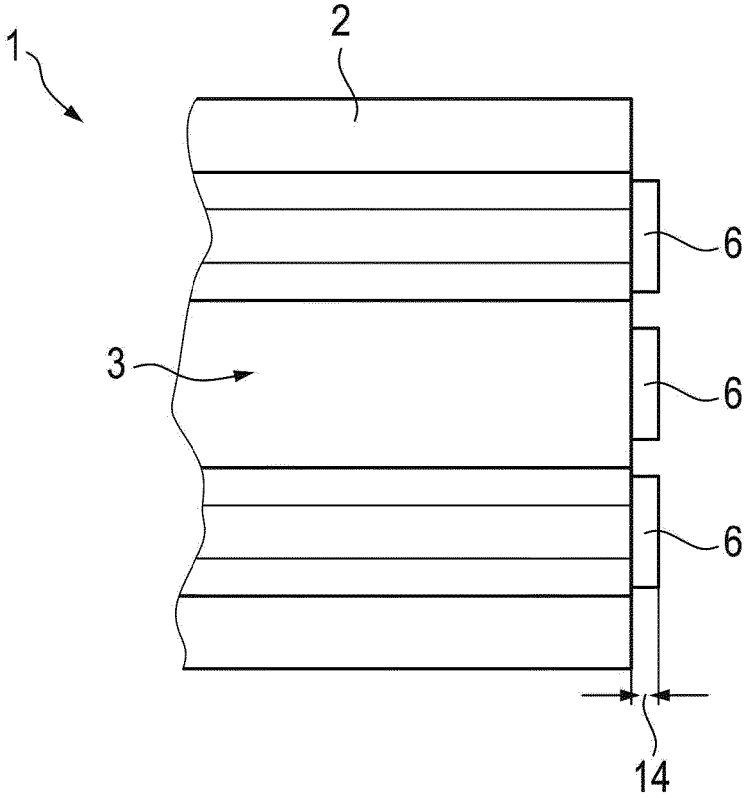

Fig. 3

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EUROPEAN SEARCH REPORT

Application Number
EP 15 18 6135

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TECHNICAL FIELDS SEARCHED (IPC)

E05B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	26 February 2016	Geerts, Arnold

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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